

ON THE OCCURRENCE OF THE GENUS *COLUMNARIA* IN THE  
UPPER SILURIAN ROCKS OF NEW SOUTH WALES.

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(Plate viii.)

I BELIEVE I am correct in stating that *Columnaria* has not so far been recognised as an Australian genus of Palæozoic Corals. When I had the pleasure of examining the Museum at St. Stanislaus College, Bathurst, a few months ago, under the guidance of the Rev. Father Dowling, I observed a coral from Molong, that I took to be *Columnaria* from macroscopic characters only, subsequently confirmed, however, by microscopic. At any rate if the coral in question be not a species of this remarkable genus, then the candid confession of my ignorance as to its systematic position must be made. Father Dowling courteously allowed me to divide the specimen, a portion of which is now in the Australian Museum.

The composite corallum (Pl. viii., Fig. 1) is small, hemispherical, but whether flat, rounded, or subpedunculate at the base, I am unable to say. The colony only measures about two inches square, and is thus even less than in *C. calicina*, Nich. The surface is covered with shallow polygonal calices that are circumscribed by prominent margins, crenulated by the strongly marked septa very distinctly visible in a weathered specimen. The corallites are closely compacted, contiguous, and completely united by their walls. Tetragonal, quadrangular, pentagonal, hexagonal, or even irregular corallites were observed, in contact throughout their entire course, without any partial separation, even near the mouths as in *C. calicina*, Nich., or some conditions of *C. alveolata*, Goldf. In thin sections prepared for the microscope, the walls are found to be composed of uniform grey sclerenchyma (stereoplasma), with only here and there any trace of a primordial wall separating them as a thin brown line; the amalgamation is therefore so perfect that nearly all trace of primordial demarcation is practically lost. Thus, in one instance, there is to be noted a decided departure from the microscopic structure of *Columnaria* described by Nicholson.\* The corallites have a very constant diameter of one millimetre. In longitudinal sections (Pl. viii., Fig. 7) the same appearances are visible, the corallites also presenting the narrow tube-like structure of the Favositidæ, but without the mural pores of the latter. There are only sixteen septa, equally divided into primary and secondary, the former extending across the visceral chambers

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\* Tabulate Corals Pal. Period, 1879, p. 192.

for about one-third of their diameter, or perhaps a little more, whilst the latter are mere marginal crenulations. These primary septa are tapering and spike-like in cross-section, although at the same time true lamellæ, extending from top to bottom of the corallites. There is not the faintest trace of any meeting of the septa in the calice centres to form a spurious columella as described in *C. rigida*, Billings.\* At first sight the corallites appear to be provided with very few septa in consequence of the small size of the secondary, and even these are set far apart. Furthermore, the septa do not spring sharply from the corallite walls, but in consequence of the inner edges of the latter being concave between them, a more or less festoon-like appearance is given to the cross-section of each corallite, somewhat as one sees in the genus *Heliolites*. These appearances at first caused doubt to arise in my mind as to the propriety of referring this coral to *Columnaria*, but on referring to Prof. Alleyne Nicholson's excellent figures,† I found that in both *C. alveolata* and *C. calicina* very much the same features existed.

The stereoplasmic thickening of the septa is unequal, some being thin and spike-like; others, from a greater preponderance of this deposit, becoming club-shaped (Pl. viii., Fig. 6). In some corallites the secondary septa become scarcely, if at all developed, in others they assume the character previously described.

In no instance have I noticed an undue predominance in length of one or more septa, a point in which *C. pauciseptata* differs from *C. calicina* at least, but there is certainly no regular development of four septa as in *Stauria*, nor the slightest trace of a division into cycles. Many of the corallites are partially infilled with a dendritic growth of iron oxide fringing the septa.

On longitudinal weathered surfaces, the primary septa appear as strong continuous lamellæ, their paucity and larger comparative size rendering them conspicuous objects.

The tabulæ (Pl. viii., Fig. 7) are particularly well developed, simple, complete, mostly horizontal, very seldom thickened, opposite in contiguous tubes, or very slightly alternating, in other words sub-opposite. They vary from three-quarters to one millimetre apart, and in a few rare instances are somewhat more distant from one another. The non-horizontal are simply bent or curved in some portion of their course, never vesicular or incomplete. The diaphragm forming the floor of the calice is striated by the septa passing on to it. The intertabular or old visceral chambers are nearly square, from the fact of the transverse measurements of the tubes and the distance apart of the tabulæ being so nearly coincident.

There is not the slightest trace of the existence of the mural pores, or intramural canals, so characteristic of the Favositidæ.

\* *Teste* Nicholson, *loc. cit.*, p. 196.

† *Loc. cit.*, t. 10, f. 1 and 2.

If this fossil be not a *Columnaria*, but a Favosite, then only one of two explanations is possible. Either the mural pores are confined to the angles of the prismatic tubes, or they are effaced by "complete recrystallisation or replacement." The former state could hardly exist without some trace of them being visible in one or another of the tube vertical sections, whilst the coral has not undergone sufficient alteration for the pores to be wholly effaced by the latter process. Had there been the slightest trace of these structures, I should have regarded this coral simply as an aberrant form of that large and important family.

Increase took place by intra-mural gemmation, the interpolation of new tubes produced from the lip of the calcine wall of a pre-existing corallite, of which there are several instances in the longitudinal sections before me. In transverse sections these young tubes are triangular or quadrangular in outline, and situated in the angles between the older. The method of increase therefore accords with that of *C. alveolata*, Goldf., and differs from that of *C. calicina*, Nich.

The main points relied on for the identification of this coral as a *Columnaria* are (1) the absence of mural pores combined with the general Favositiform structure of the corallites, both points strongly insisted on by those who have written on this group; (2) the great regularity of the tubes and tabulae, producing at once an entirety that is difficult to put into words, but apparent to any one who has examined authenticated examples of *Columnaria*, or as it was at one time better known, *Favistella*; (3) the absence of distinctive features of any other genus at all resembling it on a cursory examination. Under these circumstances I beg to propose for it the name of *Columnaria pauciseptata*, in allusion to the limited number of septa present, a point that will now be briefly touched on again.

Although numerous new species have, more or less perfectly, been described, indeed the late Prof. Ferdinand Roemer\* recorded no less than eleven, only about three seem to be at all well known, and these chiefly through the labours of my old friend Prof. Alleyne Nicholson.† They are *C. alveolata*, Goldfuss (non Hall, nec Billings, Rominger, &c.), *C. calicina*, Nich., and *C. ? halli*, Nich. (= *C. alveolata*, Hall, Billings, Rominger, &c., non Goldfuss.)

In *C. alveolata* there are in all 24-30 septa, although Rominger‡ says 20-30, the primaries sometimes extending to the centre of the calices; in *C. calicina* 28; in *C. ? halli* 20-40, and all quite

\* *Lethaea palæozoica*, 1883, Lief. 2, p. 464.

† *Loc. cit.*, pp. 191-202.

‡ Report Geol. Survey Michigan, Lower Peninsula, iii., 1876, Pt. 2, p. 91 (as *C. stellata*).

marginal; in *C. reticulata*, Salter,\* 36, the primaries extending half-way to the centre of the visceral chambers; in *C. franklini*, Salter,† although the number is not stated, they are very numerous and evidently quite marginal, like those of *C. calicina*; and in *C. gothlandica*, Ed. & H.,‡ 36-44. The literature of those forms described by Billings is not accessible to me, and I am thus unable to enter into any comparison between his species and *C. pauciseptata*. The great dissimilarity existing between the last-named and those I have just quoted will at once be apparent, for in no instance have I observed more than sixteen septa, a disparity that can have no other than a specific significance.

As compared with the tabulæ of other species, those of *C. pauciseptata* may be said to be distant from one another. In *C. alveolata* there are three in one line, horizontal or slightly flexuous according to Nicholson, whilst Romenger says flat only; in *C. calicina* the same; in *C. halli* the tabulæ appear to approach nearer to those of our species in distance from one another, and are horizontal and strong; in *C. reticulata* the tabulæ are "very close, four or five in the space of a line"; in *C. franklini* they are very closely packed, about four in the space of a line." Both these Arctic species, from the absence of mural pores, must be regarded as *Columnariae*, although they have much the appearance of massive Favosites of the *P. gothlandica* group, in which the walls have undergone so much secondary alteration that the pores are not visible, a fact well known to many microactinologists. Salter's opinion, is borne out by the absence of any reference in Mr. Etheridge's description§ of mural pores in the same corals, collected by the Nares Arctic Expedition. In *C. gothlandica* the tabulæ are said to be from one and a-half to two millimetres apart, even more distant than in *C. pauciseptata*.

The species of *Columnaria* are Silurian in their stratigraphical distribution, both Lower and Upper, with the exception of a doubtful Devonian form described by Schlüter.||

The study of this coral leads me to support Prof. Alleyne Nicholson's view that *Columnaria* cannot be placed near the Favositidæ, but as suggested by Prof. Verrill, and afterwards adopted by the former, is much more nearly allied to the Astræidæ, although I have not observed in *C. pauciseptata* any trace of endothecal structures except tabulæ.

*Type.* In St. Stanislaus' College Museum, Bathurst.

\* Sutherland's Journ. Voy. Baffin's Bay, &c., ii., 1852, p. cccxix., t. 6, f. 2, 2a.

† *Ibid.*, p. cccxix., t. 6, f. 3, 3a.

‡ Archiv. Mus. Hist. Nat., v. 1851, p. 309.

§ Quart. Journ. Geol. Soc., xxxiv., 1878, p. 586.

|| Abhandl. Geol. Specialkarte Preuss.-Thür. Staaten, viii., 1889, Heft 4, p. 14.